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ADEQUATE DIETS

FOR FAMILIES WITH

LIMITED INCOMES

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INTRODUCTION

For many families the problem of providing an adequate diet with limited resources is always present. For others it arises only when for some reason money incomes are reduced or customary home production of food is curtailed. Thus the widespread drought of 1930 and the general business depression combined to force thousands of families to face the problem of securing adequate food with unusually small supplies of home-grown foods and unusually low incomes.

There is evidence, however, that even in prosperous times many families do not have the proper food to insure good health. Retarded growth, soft and malformed teeth, poorly shaped bones, indigestion, constipation, premature aging, and a lowered resistance to disease are among the conditions attributable, in part, to unsatisfactory diet. Tuberculosis finds a foothold most readily among undernourished individuals. Although fully developed cases of such dietary-deficiency diseases as scurvy, beriberi, and xerophthalmia are rarely found in this country in normal times, a lowered efficiency may, in certain instances, be due to insufficient amounts of the vitamins preventing these diseases, and rickets and pellagra are all too frequently encountered. It has been estimated that at least 200,000 persons in our country suffered from pellagra in 1929. This disease, brought about by the lack of a certain vitamin in the food, is largely confined to certain sections of the Southern States.

This publication brings together information to help nutrition workers offer sound counsel to those who must provide adequate food for their families with limited resources, and to assist relief workers charged with distributing food supplies in times of emergency.

Because the available foods and the food customs of people differ considerably in various sections of our country, it has seemed wise to separate the suggestions for low-cost diets into two main groups. The first part of this publication, therefore, is devoted to diets and

¹ This publication is based upon Extension Service Circular 139, *Buy Health Protection With Your Food Money*, which was prepared at the request of the National Drought Relief Committee by Hazel K. Stiebeling, Senior Food Economist, and Hazel E. Munsell, Senior Nutrition Chemist, both of the Bureau of Home Economics, Miriam Birdseye, Extension Nutritionist, Office of Cooperative Extension Work, U. S. Department of Agriculture; W. H. Sebrell, Passed Assistant Surgeon, U. S. Public Health Service; and Clyde B. Schuman, Director of Nutrition Service, of the American Red Cross.

meal-planning suggestions likely to prove acceptable to persons accustomed to wide variety in foods, while the second part suggests diets and meal plans for families who in times of stress are used to subsisting mainly on a "meat (salt pork), meal, and molasses" ration. If insufficiently supplemented, a restricted diet of this kind induces serious nutritional disorders, notably the dietary-deficiency disease known as pellagra.

In the third part are presented certain tables and other information equally applicable to the dietary problems considered in both sections.

Before proceeding to this dietary information, three very practical considerations must be emphasized:

(1) In discussing the food problem with persons receiving low incomes, there is special need to emphasize the importance of an adequate diet in maintaining health and efficiency in adults and good growth and development in children.

(2) For most rural families and for many families in small towns, the teaching of food selection and nutrition needs to be supplemented by a program of home food production and conservation. By making it possible to provide an adequate diet and attractive meals with a minimum cash outlay, such a program makes for both health and economy. The "live-at-home" program of the cooperative extension service in agriculture and home economics, and particularly of the home demonstration agents who work with rural home makers, is based on this fact. The Red Cross has recognized the importance of the home food-production plans in its teaching, rehabilitation, and relief programs. Wherever it is economically sound for families to maintain a home garden, a flock of poultry, and one or more cows, and to produce their own meat supply an appropriate home food-production program should be indorsed by every agency concerned with the public health.

(3) In order to provide for low-cost diets such as those suggested in this publication, it may often be necessary to obtain the cooperation of food dealers and business men's associations in making available certain inexpensive and nutritious foods not on the local market. On the other hand it will be necessary to stimulate a demand for these foods on the part of consumers who may be unfamiliar with their value or their use.

Nothing in this publication should be construed to minimize the value of the desirable standard of food habits held up for rural families by the cooperative extension service in agriculture and home economics. This standard includes a quart of milk a day for children and a pint for adults, five servings of vegetables and fruits, among them one leafy vegetable and one raw fruit or vegetable or canned tomatoes. It includes also some dark cereals, two servings of protein-rich food in addition to the milk, and plenty of water. There seems no reason to recede from these food habits as a desirable standard for normal times, especially for families that can raise an abundance and variety of nourishing foods at minimum cost.

LOW-COST DIETS FOR GENERAL USE

GOOD PROPORTIONS IN THE LOW-COST DIET

In planning the low-cost diet, food materials which yield energy cheaply must be used as extensively as is possible without displacing unduly the foods necessary for building or maintaining the body and for regulating body processes.

In practical terms this means that the proportion of grain products in the low-cost diet will be higher than in diets of moderate cost. Although some forms of fat and sugar are cheap sources of energy also, they contribute relatively less to the diet as a whole, than do the grain products, and the effect of increased amounts upon appetite and digestion is probably less favorable. Therefore, fats and sugar are used in the low-cost diet only to about the same extent as in a diet of moderate cost.

As will be pointed out in this publication, milk supplements the nutritive qualities of the grain products at more points than does any other food, and does this effectively and at relatively small expense. Hence when there is little money to spend the diet will be most satisfactory for good nutrition if it is built around grain products and milk.

Vegetables and fruits are, on the whole, expensive sources of energy, and are used in low-cost diets (except for rural families who can produce them at home) only to the extent necessary to supplement grain products and milk in vitamins and inorganic elements.

Lean meat, fish, poultry, and eggs are also relatively expensive foods. Only small amounts can be included in low-cost diets especially if these foods must be purchased. Because they are easily prepared and are very palatable these food materials add much to the satisfaction which a family derives from its food.

In general the low-cost diet differs from a moderate-priced diet chiefly in its higher proportion of grain products and lower proportion of meats, fish, poultry, and eggs, although the quantities of fats, vegetables, and fruit may be slightly reduced.

The following family food guide summarizes the low-cost diet in convenient form:

FAMILY FOOD GUIDE

Every meal: Milk for children, bread for all.

Every day:

- Cereal in porridge or puddings.
- Potatoes.
- Tomatoes (or oranges) for children.
- A green or yellow vegetable.
- A fruit or additional vegetable.
- Milk for all.

Two to four times a week:

- Tomatoes for all.
- Dried beans and peas or peanuts.
- Eggs (especially for children).
- Lean meat, fish or poultry, or cheese.

SUGGESTED LOW-COST WEEKLY FOOD SUPPLY

The diets of children and adults differ not only in total quantity but also in the proportion in which many food materials should be used. Hence tables are here presented showing approximately the amount of food needed weekly by persons of various ages and by families of varying composition. In these diets quantities have been stated somewhat flexibly to allow for variations in total food requirement and to permit some choice within the various food groups for adjustment to the native food supply, to individual dietary habits, or to special needs.

Listed in Table 1 are the approximate amounts of foods which will meet the needs of persons of various ages. By adding together the amounts needed by individual members, the approximate total amount needed for any group can readily be found. In Table 2 are

presented amounts needed by typical family groups. These combinations and proportions of food give good returns for a limited outlay of money, and while these are not considered optimum for nutrition, it is believed that they are adequate. Any changes should be made with great discretion, preferably only by a person well trained in nutrition.

TABLE 1.—*Suggested low-cost weekly food supply for persons of various ages*

Food	Unit	Man	Woman	Boy, 14-17 years	Girl, 14-17 years	Boy, 9-13 years	Girl, 9-13 years	Child, 6-8 years	Child, 3-5 years	Child, 2 years or less
Grain products:										
Bread.....	Pound..	5-7	4-5	4-5	2	2-3	2-3	1-3	3-1	$\frac{1}{2}$ -1
Flour.....	do.....	1	$\frac{1}{2}$ -1	$\frac{1}{2}$ -1	$\frac{1}{2}$ -1	$\frac{1}{2}$ -1	$\frac{1}{2}$	(1)	(1)	(1)
Cereal.....	do.....	1-2	1	1	1	$\frac{1}{2}$ -1	$\frac{1}{2}$ -1	1	$\frac{1}{2}$ -1	$\frac{1}{2}$
Milk ²	Quart..	1-3 $\frac{1}{2}$	3 $\frac{1}{2}$ -7	3 $\frac{1}{2}$ -5	5-7	7	7	7	7	7
Vegetables and fruits:										
Potatoes.....	Pound..	4-7	3-4	5-7	4-5	4-6	3-4	2-3	2	1-2
Legumes.....	do.....	$\frac{1}{4}$ - $\frac{3}{4}$	$\frac{1}{4}$ - $\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$ - $\frac{1}{2}$	$\frac{1}{4}$ - $\frac{1}{2}$	$\frac{1}{4}$	(1)	(1)	-----
Tomatoes or oranges.....	do.....	1 $\frac{1}{2}$ -2	1 $\frac{1}{2}$ -2	1 $\frac{1}{2}$ -2	1 $\frac{1}{2}$ -2	1-2	1-2	1-1 $\frac{1}{2}$	1-1 $\frac{1}{2}$	1
Other vegetables and fruits.....	do.....	5-8	4-6	3-5	3-5	3-5	3-5	3-5	3-4	1-2
Fats and oils, including bacon and salt pork.....	do.....	1	$\frac{3}{4}$	1	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{4}$ - $\frac{1}{2}$	$\frac{1}{8}$ - $\frac{1}{4}$	(1)
Sugars.....	do.....	1-1 $\frac{1}{2}$	1-1 $\frac{1}{4}$	1-1 $\frac{1}{4}$	1	$\frac{3}{4}$ -1	$\frac{3}{4}$	$\frac{1}{4}$ - $\frac{1}{3}$	$\frac{1}{8}$	(1)
Lean meat, fish, and poultry.....	do.....	1 $\frac{1}{2}$ -2	1-2	1 $\frac{1}{2}$ -2	1-2	1-2	1-1 $\frac{1}{2}$	$\frac{1}{4}$ - $\frac{1}{2}$	(1)	-----
Eggs.....	Number	1-3	1-3	1-3	1-3	3-4	3-4	5-7	5-7	3-4
Cheese, nuts, gelatin.....	Pound..	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$	(1)	-----	-----
Beverages (select one):										
Coffee.....	do.....	$\frac{1}{2}$	$\frac{1}{4}$	-----	-----	-----	-----	-----	-----	-----
Tea.....	do.....	$\frac{1}{2}$	$\frac{1}{4}$	-----	-----	-----	-----	-----	-----	-----
Cocoa.....	do.....	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	-----	-----	-----
Cod-liver oil.....	-----	-----	-----	-----	-----	-----	-----	(2)	(2)	(2)

¹ Children may have some of food named but amount is too small to note here.

² See equivalent weights and measures of selected food materials, p. 6.

³ Cod-liver oil is a desirable food. Use 1 teaspoon to 1 tablespoon daily (especially during the winter)

TABLE 2.—*Suggested low-cost weekly food supply for families of given composition*

Food material	Unit	Family composition				
		2 adults; 1 child, aged 3 years	2 adults; 3 chil- dren, aged 2, 4, and 7 years	2 adults; 5 chil- dren, aged 2, 5, 8, 12, and 15 years	3 adults; 7 chil- dren, aged 2, 4, 6, 8, 10, 13 and 15 years	4 adults
Grain products:						
Bread.....	Pound.....	Quantity 10-15	Quantity 12-16	Quantity 16-22	Quantity 25-35	Quantity 20-25
Flour.....	do.....	1-2	1-2	3-4	3-5	4
Cereal.....	do.....	3-4	4-6	6-8	10-12	4-7
Milk ¹	Quart..	9-14	23-28	30-42	43-56	4-14
Vegetables and fruits:						
Potatoes.....	Pound.....	8-10	15-20	20-30	30-40	15-20
Legumes, such as dried beans, peas, lentils, and peanut butter.....	do.....	1-2	1-2	1-3	2-5	1-3
Tomatoes, fresh or canned (or oranges).....	do.....	4	6	9	12	6
Other vegetables, fresh or canned (include some of green or yellow color as carrots, cabbage, spinach, string beans); turnips, onions, beets, and inexpensive fruit, fresh, canned, or dried, ¹ as apples, bananas, berries, prunes, peaches.....	do.....	12-14	15-18	20-25	30-40	20-25
Fats and oils including salt pork, and bacon.....	do.....	2	2 $\frac{1}{2}$	4	6	4
Sugar ¹ (use some unrefined cane molasses).....	do.....	2 $\frac{1}{2}$	3	5	7	5
Lean meat, liver, fish, cheese, eggs.....	do.....	3-5	5-7	7-10	10-14	5-10
Additional eggs (for younger children).....	Number..	3	8	8	8	-----

¹ See equivalent weights and measures of selected food materials, p. 6.

On the basis of these dietary plans, the weekly food supply of a family composed of two adults at active work, a boy of 12 to 15 years, a girl of 4 to 8 years, and a child under 3 years might include, for example:

Cereals, 20 to 24 pounds.

White flour,¹ 6 to 8 pounds or bread 9 to 12 pounds.

Graham or whole wheat flour¹ or cereal, 4 to 6 pounds or bread 6 to 9 pounds.

Corn meal, 3 to 5 pounds.

Hominy grits, farina, or rice, 3 to 5 pounds.

Rolled oats, 1 to 2 pounds.

Milk, fresh whole (or its equivalent¹ in evaporated or dried milk), 18 to 21 quarts.

Vegetables and fruits, 35 to 40 pounds.

Potatoes and sweetpotatoes, 14 pounds.

Tomatoes, canned or fresh, 3 No. 3 cans¹ or 6 pounds.

Dried peas, beans, lentils, peanut butter, 1 to 2 pounds.

Other vegetables, 10 to 12 pounds.

Kale, spinach, collards, mustard greens, beet and turnip tops, chard, or lettuce 4 to 5 pounds and beets, carrots, onions, turnips. 6 to 7 pounds.

Additional vegetables whenever possible.

Fruits: Fresh or canned, as apples, bananas, berries, oranges, peaches, pears, watermelon, 4 to 6 pounds, or dried fruit (¹) 1 to 1½ pounds.

Fats, 3 to 4 pounds.

Salt pork, fat, 1 to 2 pounds.

Lard, 1 pound.

Butter, 1 pound.

Sugars, 3 to 5 pounds.

Sugar, 1 to 2 pounds.

Unrefined cane or sorgo sirup¹ 1 quart.

Lean meat, fish, eggs, cheese, 6 to 8 pounds.

Lean beef, lamb, pork; poultry; fresh fish, 3 to 5 pounds.

Dried fish ½ pound, or canned salmon, 1 pound.

Cheese, 1 pound.

Eggs, 8 to 12.

The figures on equivalent weights and measures of selected food materials will prove useful in adapting the various market orders suggested in this publication to individual situations.

EQUIVALENT WEIGHTS AND MEASURES OF SELECTED FOOD MATERIALS

Milk:

If fluid milk is not available, 1 pound of unsweetened canned milk may be used for each quart of fluid milk. To use dry skim milk in any diet which calls for whole fluid milk, allow for every 5 quarts of whole milk 1 pound of dry skim milk, and provide in addition 5 to 6 ounces of butter.

1 quart fresh whole milk weighs approximately 2.2 pounds.

1 quart fresh skim milk weighs approximately 2.2 pounds.

1 pound evaporated whole, unsweetened milk corresponds to 2.4 pounds or 1 quart fluid whole milk.

1 pound dried whole milk corresponds to 8 pounds or 3¾ quarts fluid whole milk.

4½ ounces dried whole milk corresponds to 1 quart fluid milk.

3 ounces dried skim milk corresponds to 1 quart fluid skim milk.

1 pound dried skim milk corresponds to 11 pounds or 5 quarts fluid skim milk.

Bread:

10 to 11 ounces flour makes 1 pound bread.

1 pound flour makes 1½ pounds bread.

Eggs: 1 dozen as purchased weighs about 1½ pounds.

Molasses:

Cane, 1 quart (2.9 pounds) corresponds to 2 pounds cane or beet sugar.

Tomatoes:

1 No. 3 can or 1 quart jar weighs approximately 2 pounds.

1 No. 2 can weighs 1.2 pounds.

Fruit: 1 pound dried corresponds to approximately 4 to 5 pounds fresh.

¹ See equivalent weights and measures of selected food materials, p. 6.

SUGGESTIONS FOR MENUS

The following menus indicate the type of meals which can be prepared from these diets:

BREAKFAST

Cooked cereal with milk.
Toast, biscuit, muffins, griddle cakes, or fried mush.
Molasses occasionally.
Milk for children.
Coffee for adults.

DINNER

Main dish—bean or pea soup, baked beans; creamed or escalloped fish; eggs; Swiss steak, meat loaf, or meat stew; rice, spaghetti or macaroni with cheese or meat.
Potatoes.
Vegetables, cooked or raw.
Bread.
Milk, for children.
Dessert occasionally.

SUPPER

A hearty dish, such as a thick milk or vegetable chowder or stew, vegetable hash, creamed or scalloped vegetable, baked potato, macaroni or spaghetti, hot cereal and milk.
Bread.
Dessert consisting of fresh or stewed fruit, gelatin pudding, cereal pudding, fruit or custard pie.
Milk for children.

The allowance of meat recommended is small, but its flavor can be extended and the whole meal made more palatable if vegetables are cooked with it. When cooking vegetables in this combination add them when the meat is partially done so they will not be overcooked. Other ways by which the flavor can be extended are by making stuffing, or dumplings with gravy, or by cooking the meat with potatoes, rice, or macaroni.

The skillful use of onions, carrots, celery, and tomatoes in small amounts heightens the flavor of stews and soups, and at the same time it adds to the attractiveness of meals. The housewife should definitely plan to use part of the weekly allowance of vegetables for this purpose.

EMERGENCY LOW-COST DIETS FOR USE IN AREAS WHERE PELLAGRA IS PREVALENT

The low-cost diets already suggested are adequate for nutrition in the light of present knowledge. Doubtless, pellagra would be non-existent in this country if such a food supply were used by every family.

But when families have few resources and live for the three or four months of winter and early spring quite largely on fat meat, corn-meal, and molasses, it is almost inevitable that pellagra will appear. (A brief discussion of this disease will be found at the end of this section.) The "meat, meal, and molasses" ration is deficient in so many respects that almost any protective food improves it. Milk in any form and lean meat, fish, or poultry are of greatest practical importance as pellagra preventives, but tomatoes, cheese, eggs, beans, peas, and some leafy and other vegetables all add their bit of protection.

EMERGENCY FOOD GUIDE

Add to fat meat, corn meal, and molasses:

Every day—

Milk in some form.

Vegetables, as many as possible.

Several times a week—

Lean meat, poultry, fish, cheese, eggs.

Dried beans, peas, peanuts.

Tomatoes.

For children—

Milk at every meal.

A little tomato juice daily.

Eggs when they can be afforded.

SUGGESTED MINIMUM-COST WEEKLY FOOD SUPPLY

In Table 3 are presented some minimum-cost basic diets for families who have little or no home-produced food. Several combinations of inexpensive pellagra-preventing food materials are indicated. The use of the larger quantities of protective foods will probably keep the family free from pellagra. The use of the smaller amounts will probably reduce the incidence and severity of the disease. The basic food supply is not considered wholly adequate but represents a wise investment when the available money is very limited.

These minimum basic rations should be supplemented whenever possible by the addition of green leafy and other vegetables, eggs, poultry, butter, more milk, and lean meat. With proper management the garden, the cow, the pig, and the hen will give a supply of protective foods for a small outlay of cash.

TABLE 3.—*Emergency minimum weekly food supply for families of given composition*

		Unit	Family composition				
			2 adults; 1 child, aged 3 years	2 adults; 3 chil- dren, aged 2, 4, 7 years	2 adults; 5 chil- dren, aged 2, 5, 8, 12, 15 years	3 adults 7 chil- dren, aged 2, 4, 8, 10, 13, 15 years	4 adults
Food material			Quantity	Quantity	Quantity	Quantity	Quantity
Use all of these foods	Flour.....	Pound..	6	10	18	24	12
	Meal.....	do.....	8	12	18	30	12
	Salt pork.....	do.....	2	2	3	4	3
	Lard.....	do.....	1	1	2	3	2
	Molasses.....	Quart..	$\frac{3}{4}$	1	2	2	$1\frac{1}{2}$
	Tomatoes.....	Pound..	1	2	3	4	2
	Milk ¹ (for young- er children).....	Quart..	2	6	6	6	-----
	Dry skim milk.....	Pound..	2-3	3-5	5-7	7-10	3-4
	Dried peas and beans.....	do.....	2	3	5	7	4
	or Dry skim milk.....	do.....	2	3	4	5	2
Always use one of these food combinations for pellagra protection	Canned fish and lean meat.....	do.....	1-3	2-4	3-6	4-9	2-5
	Dried beans and peas.....	do.....	2	3	5	7	4
	or Dry skim milk.....	do.....	1-2	1-3	3-4	3-5	2-3
	Wheat germ.....	do.....	2-3	4-5	5-7	9-12	3-4
	or Lean meat and fish.....	do.....	6-8	8-12	12-18	18-25	7-10
	Dried beans and peas.....	do.....	2	3	5	7	4

¹ See equivalent weights and measures of selected food materials, p. 6.

The dry skim milk and wheat germ may be mixed with the flour or meal. This "reinforced" mixture can then be used for making any products in which plain flour or meal are ordinarily used.

FOODS RICH IN THE PELLAGRA-PREVENTIVE VITAMIN

Table 4 lists the foods which are good or excellent sources of the pellagra-preventive factor, and for which there is evidence of the approximate amount required to protect a human being against the disease if his diet contains practically no other sources of this factor. These foods are milk, lean muscle meat, liver, canned salmon, tomato juice, wheat germ, and yeast. Present knowledge of the pellagra-preventive factor is still limited and few foods have as yet been tested with human subjects. However, there is reason to believe that cheese, eggs, peas, beans, whole grains and some leafy and other vegetables all add their bit of protection even though they are not as rich as the foods listed.

TABLE 4.—*Some foods rich in the pellagra-preventive factor*

Food material	Amounts per person	
	Daily	Weekly
Milk:		
Fresh—		
Whole.....	1 quart.....	7 quarts.
Skim.....	do.....	Do.
Buttermilk.....	do.....	Do.
Evaporated unsweetened, whole.....	16 ounces (1 pint).....	7 pounds.
Dried—		
Whole.....	5 ounces.....	2.2 pounds.
Skim.....	3.5 ounces.....	1.5 pounds.
Meat:		
Lean muscle.....	½ pound.....	3.5 pounds.
Liver.....	do.....	Do.
Salmon, canned.....	do.....	Do.
Tomato juice.....	1¼ quart.....	9 quarts.
Wheat germ.....	5 ounces.....	2.2 pounds.
Yeast, pure dried, bakers, brewers'.....	1 ounce for adult.....	7 ounces.
	½ ounce for child under 12.....	3.5 ounces.

Table 4 should be helpful to persons who wish to study the extent of protection against pellagra provided by the low-cost market orders included in this publication. In evaluating the cost of two food materials rich in the pellagra-preventive factor, the reader should also study Table 6 to determine what other important contributions to the diet are made by each of the food materials in question. For example, yeast is very rich in the pellagra-preventive factor and is a good source of vitamin B, but in the quantities needed for the prevention or cure of pellagra it does not provide important amounts of other food essentials. On the other hand, dry skim milk may seem a more expensive source of the pellagra-preventive factor than is yeast, but in the quantities recommended for protection it supplies, in addition, vitamin B, important amounts of the so-called efficient proteins, an abundance of calcium and phosphorus, and some easily assimilable iron. Whole milk supplies vitamins A and D also. This shows that from the point of view of body building and health protection money expended for milk is well invested.

SOME FACTS ABOUT PELLAGRA

Pellagra is a disease which is endemic in certain sections of the Southern States. The following information on pellagra has been compiled from various publications of the United States Public Health Service.

CAUSE

Although pellagra is directly due to a lack of the pellagra-preventive factor owing to an insufficient amount of certain foods, including milk and fresh lean meat, it is indirectly attributable to poverty. In studies made of the situation by the United States Public Health Service, Goldberger and his associates found a striking inverse relationship between family income and pellagra incidence, and a seasonal fluctuation of the disease corresponding to the ability of the family to obtain adequate diet.

WOMEN AND CHILDREN MOST FREQUENT VICTIMS

Pellagra occurs in a mild form with great frequency among children from 2 to 15 years of age. It occurs very frequently also among women from 20 to 40 years of age, especially among those with families. It is suspected that many such women tend to deprive themselves of certain foods in favor of other members of the family. Growing children and expectant and nursing mothers probably need more of the pellagra-preventive factor than do other members of the family.

SYMPTOMS OF PELLAGRA

A loss of strength, with indigestion or nervousness or both, appearing or increasing in the late winter or spring and improving in the fall, weariness, dizziness or vertigo, discomfort or pain in the pit of the stomach, headaches, wakefulness, and frequently also sluggish bowel action are common early symptoms of the disease. Such symptoms may, of course, be due also to causes other than pellagra. A burning or scalding of the mouth, reddened tongue, and burning of the hands and feet may be characteristics of later stages of pellagra, and their presence justifies a suspicion of the disease, especially if the individual is known to use a diet low in milk, meat, vegetables, and fruit. For such symptoms, counsel should be given as to improving the diet, but at the same time the individual should be urged to seek competent medical advice. The most definite and characteristic signs of the disease are the more or less bilaterally symmetrical skin lesions, at first appearing like sunburn, then turning a dirty-brown color, parchmentlike in texture, after which the skin becomes rough and scaly, and even cracks and peels. The eruption appears most frequently on the backs of the hands, on the feet, forearms, legs, neck, and back.

In children, a close observer may detect such symptoms as listlessness and fretfulness, loss of activity and loss of weight, but these preliminary indications often escape notice until the appearance of the characteristic eruption.

A SEASONAL DISEASE

Pellagra is practically nonexistent from November through February. In the late winter and early spring, the food supply of some families consists largely of highly refined cereals, fat salt pork, lard, sugar and sirup. The absence of a sufficient quantity of the pellagra-preventive vitamin in this combination of foods brings on

the disease by April or May and recurrent attacks usually appear slightly earlier than the initial onset. The number of cases usually reaches a peak by June, after which it rapidly declines, until by November most of the cases have disappeared.

In addition to this seasonal variation, there is a marked year-to-year fluctuation, inversely proportional to the purchasing power of the family or to the productiveness of the cow or garden, or both. In the wake of lowered wages as well as of such disasters as floods, hurricanes, or droughts, there is an increase in the number of cases of pellagra.

CURATIVE VALUE OF YEAST

Dried bakers' or brewers' yeast is so rich in the pellagra-preventive factor that it is a cheap and specific cure and preventive for the disease. Experience shows, however, that yeast is usually considered as a medicine rather than as a food, and that its use is likely to be discontinued shortly after recovery is completed. Unless the diet has meantime improved, a recurrence of the disease may take place. For this reason all agencies should cooperate in helping families to procure a well-balanced food supply throughout the year.

GENERAL CONSIDERATIONS IN PLANNING LOW-COST DIETS

THE FOOD REQUIREMENT OF THE FAMILY GROUP

To provide for good nutrition the diet must furnish in an attractive palatable and digestible form (1) enough of the carbohydrates, fats, and proteins to yield energy for bodily activity; (2) a liberal supply of suitable proteins; (3) enough of all the essential mineral elements; and (4) enough of each of the necessary vitamins.

ENERGY

The energy requirements of family groups may vary considerably because of the differences in muscular activity and differences in the sizes and ages of the individual members. The usual energy allowance made per day for a man weighing about 150 pounds at moderately active work is 3,000 calories. At sedentary occupations he needs fewer calories; at active work, like farming, the same man needs more calories, probably 600 to 1,000 more per day. For the adult woman are allowed 2,200 to 3,000 calories, depending largely upon her activity. The energy requirements of children are summarized in a table in the third edition of Rose's Laboratory Handbook for Dietetics, which is here reproduced by permission of the publishers, Macmillan & Co., as Table 5.

TABLE 5.—Average total energy requirements of children

Age, years	Calories per day		Age, years	Calories per day	
	Boys	Girls		Boys	Girls
1.....	900-1,200	800-1,000	10.....	2,100-2,700	1,900-2,600
2.....	1,100-1,300	1,000-1,250	11.....	2,100-2,800	2,000-2,800
3.....	1,100-1,400	1,050-1,350	12.....	2,300-3,000	2,100-3,000
4.....	1,200-1,500	1,150-1,400	13.....	2,500-3,500	2,300-3,400
5.....	1,300-1,600	1,200-1,500	14.....	2,600-3,800	2,400-3,000
6.....	1,500-1,900	1,450-1,800	15.....	2,700-4,000	2,400-2,800
7.....	1,600-2,100	1,500-1,900	16.....	2,700-4,000	2,200-2,800
8.....	1,700-2,300	1,600-2,200	17.....	2,800-3,800	2,100-2,800
9.....	1,900-2,500	1,800-2,500			

It is because of this variation in the fuel requirement of individuals and groups that a range in quantity has been suggested for some of the food materials included in the diets given in this publication. The smaller amounts will probably be sufficient if the individuals are sedentary, and the larger if the persons are very active.

PROTEINS

When a dietary furnishing a sufficient number of calories provides between 10 and 15 per cent of the total calories from proteins, the quantity of protein is assured. It is important, however, particularly during the period of growth, that the proteins be of high biological value. Milk, eggs, and the lean meats are notable for their efficient proteins. As a rule American diets contain liberal amounts of these, but the diets of people among whom pellagra is prevalent are often rather low in protein, with much of it derived from cereals and of inferior biological value until properly supplemented, as with milk or eggs.

It is believed that the diets suggested in this publication are adequate in their protein allowance.

INORGANIC ELEMENTS

Many inorganic elements are included among the normal constituents of the body, and the intake of each essential element must be equal to the output to maintain normal nutrition of the adult, and in the case of children, must provide in addition, an amount for the storage incidental to the growth of tissues.

The food habits of our people do not make it safe to leave to chance the supply of some of the elements which are essential both to the construction and functioning of the body. Special consideration must be given to the ample provision of calcium, phosphorus, iron, perhaps copper, and in some localities, iodine.

The diets suggested in this publication will provide about a 50 per cent margin of safety above the average minimum requirements for calcium, phosphorus, and iron. For the adult this means approximately 0.68 gram of calcium, (1.0 gram calcium for the pregnant or nursing woman), 1.32 grams of phosphorus, and 0.015 gram of iron. For children 1 gram of calcium has been allowed up to the age of 13, and at least a gram of phosphorus for children over 2 years of age. For all children 5 milligrams of iron have been allowed for every 100 calories provided by the diet.

VITAMINS

A well-balanced diet must include not only enough calories, sufficient protein of the right quality, and enough of all the necessary minerals, but also enough of all of the vitamins to provide for growth and health. No attempt is made in this publication to state the allowance quantitatively, but the amounts of the food materials known to be important sources of each of the recognized vitamins have been made as liberal as possible in the face of limited resources.

The specific functions of certain vitamins are briefly summarized as follows:

Vitamin A keeps epithelial tissue resistant to bacterial infection, especially the lining of air passages, glands of the mouth, lungs, sinuses and ears, the eye, the digestive tract, the reproductive organs, and the bladder. Although it can be stored in the tissues of the body in

considerable amounts, it is desirable that the diet contain at all times much more than will merely prevent these infections.

Vitamin B prevents beriberi. It stimulates the appetite and promotes good digestion and assimilation of food. The body has only a limited capacity for storing vitamin B; therefore the food supply should contain an abundance at all times.

A decided shortage of vitamin C is followed by scurvy, a disorder characterized by stiffness and soreness of the joints, soreness of the gums, and loosening of the teeth. It has been observed that on diets deficient but not entirely lacking in vitamin C, children become irritable and lacking in stamina, fail to grow normally, and are less resistant to infectious diseases. Shortage of vitamin C is thought to be an important factor in tooth decay and in much of the so-called rheumatism. Vitamin C is destroyed by long cooking. The use of soda in cooking vegetables also has a deleterious effect on this vitamin. Because the body does not store much vitamin C, the diet should include at all times an abundance of foods containing this vitamin.

Vitamin D is concerned with the normal metabolism of calcium and phosphorus at all ages. Rickets in young children is the most common result of a diet poorly balanced in vitamin D, calcium, and phosphorus. A generous amount of this vitamin in the diet or its equivalent in sunlight is probably also a factor in the prevention of dental caries, and a means of preventing other less prominent disturbances of mineral metabolism. But vitamin D as a "calcium-mobilizing" factor is not a substitute for calcium.

Vitamin G includes the pellagra-preventive vitamin and other relatively heat-stable water-soluble factors.

Besides performing these specific functions the vitamins listed above are essential to growth and health.

VALUE OF VARIOUS TYPES OF FOOD IN THE DIET

Six types of food materials are depended upon to satisfy the food needs of the body.

Grain products.—Bread, cereal, flour. Refined grain products are cheap sources of energy and protein, but are poor in minerals and vitamins. Their proteins are not wholly adequate, but can be advantageously supplemented, as with milk. The more highly the cereal is milled, the more necessary it is to supply minerals and vitamins from other sources. When cost need not be considered these may be supplied by vegetables and fruits, eggs, lean meat, and milk. But when every penny must count, using whole-wheat bread or flour, or one of the dark, less highly refined wheat cereals about once a day increases the iron content of the diet at little cost. Wheat can be used whole or can be ground at home for flour or breakfast cereal.

Using about 1 pound of wheat germ, rich both in the pellagra-preventive factor and in vitamin B, or 1 pound of rice polishings (obtainable from rice mills from August to April) rich in vitamin B and containing some vitamin G, for every 25 pounds of flour or cereal adds to the low-cost diet a desirable margin of safety in these values. Both wheat germ and rice polish should be obtained in small quantities at frequent intervals, as they become rancid upon standing. Milling practices differ in the extent to which wheat germ is separated from other parts of the grain. When the mill makes a fairly thorough separation the germ meal contains relatively little bran, and it is this type of product which is recommended in this of publication.

Milk and cheese.—Milk contains the greatest assortment of nutrients of any single food material, and is the foundation upon which an adequate diet can most safely and easily be built. It is particularly important for its high-quality proteins, for calcium, for vitamin A, and for the pellagra-preventing factor, and in these respects effectively supplements the cereal products. For each child under 2 years of age 7 quarts of fresh whole milk should, if possible, be provided weekly, and for each other child at least 5 quarts of fresh whole milk or equivalent amounts in evaporated or dry milk. One to three quarts of milk should be provided each week for each adult, and 7 quarts per week should be allowed for a pregnant or nursing mother.

Evaporated milk and milk powder are convenient and economical forms in localities where it is difficult to procure good fresh milk and where ice is not available. Evaporated milk may be a cheaper form of milk than the fresh whole product. In many localities skim-milk powder is the cheapest form in which milk solids can be secured. If skim milk is used instead of whole, some extra butter should be added weekly to the diet to supply vitamins A and D, removed with the butterfat in the separation process.

Vegetables and fruits.—These foods vary widely in their energy values and in minerals and vitamins. Tomatoes and oranges deserve special mention as sources of vitamin C, and vegetables of green or yellow color as sources of vitamin A and of iron. Dried beans and peas are good sources of vitamin B. Small amounts are also contributed by most fresh vegetables and fruits. Care should be taken in the preparation of vegetables to conserve their mineral and vitamin values.

Fats.—Fats are important primarily as sources of energy; they also help to make a high-cereal diet palatable. Lard is usually the cheapest form of fat, but it is deficient in some of the vitamins found in other fats such as butter. Lard may be used as the chief fat in the family diet, if whole milk is used liberally.

Sugar.—Pure sugar provides only energy to the body. During the refining process all of the minerals are removed. To replace 2 pounds of the sugar allowance with a quart of unrefined cane or sorgo sirup increases greatly the calcium and iron content of the food supply, and is recommended in very limited diets. Corn sirup and refined sugar sirup are cheap and wholesome sources of energy but are not of the same nutritional importance as unrefined cane molasses.

Eggs, lean meat, and fish.—Lean meats and fish are important in the diet for their proteins of excellent quality and for their pellagra-preventive value. Fresh fish, locally caught, or inexpensive grades of canned fish, or a corresponding amount of dried fish may be used in the low-cost diet. The cheaper cuts of lean meat are as nutritious as the more expensive tender cuts, but special care is required for their preparation.

Eggs are important for iron and some other minerals, and for vitamins A and D, as well as for protein. If the egg supply is limited, the children should be considered first.

NUTRITIVE VALUE OF SELECTED FOOD MATERIALS

In Tables 6 and 7 is indicated the value of selected food materials in certain dietary essentials. These figures will be helpful to those interested in studying in greater detail the contributions of individual food materials to the diet.

TABLE 6—Nutritive value of selected food materials

Food material	Vitamins					Protein	Calcium	Phosphorus	Iron
	A	B ¹	C	D	G ¹				
Milk:									
Whole—Fresh, evaporated, dried.....	xxx ²	x		x	xx	xxx	xxx	xxx	x
Skim—fresh, evaporated, dried.....		x			xx	xxx	xxx	xxx	x
Buttermilk.....	x	x			xx	xxx	xxx	xxx	x
Cheese, American.....	xx				x	xxx	xxx	xxx	
Eggs.....	xx	x		x	xx	xxx		x	xx
Meat:									
Lean muscle.....	x	x			xx	xxx		xx	x
Liver, kidney.....	xxx	xx			xxx	xxx		xx	xx
Fish ³		x			xx	xxx		xx	
Shellfish, ³ oysters, clams.....	x	x			x	xxx		x	xx
Vegetables:									
Tomatoes, raw or canned.....	xx	xx	xxx		xx				
Thin green leaves, cooked—									
Kale, mustard, spinach, collards, turnip greens.....	xxx	x	x		x			xx	xxx
Lettuce, green, raw.....	xxx	xx	xxx		x		x		x
Cabbage, green, raw.....	xx	xx	xxx		x		xx		xx
Roots and tubers:									
Potatoes, cooked.....	x	xx	x						xx
Sweet potatoes, yams, cooked.....	xx	xx	x						x
Carrots, raw.....	xxx	xx	xx				x		x
Onions, turnips, cooked.....		x	x				x		x
Rutabagas, raw.....	x	xx	xxx				x		x
Pumpkin, squash.....	xx	x	x						x
Dried peas, beans.....		xx			x	xx	xx	x	xx
Fruits, raw:									
Apples, peaches, pears.....	x	x	xx						
Bananas.....	x	x	xx						
Oranges.....	xx	xx	xxx				x		
Figs, fresh or dried.....							xx		xx
Dried prunes.....	xx	xx							xx
Whole wheat products.....	x	xx				x		xx	xx
Wheat germ.....	xx	xxx			xx			x	
Rice polishings.....		xx				x			
Molasses, cane or sorgo sirup.....		x					x		xxx
Butter.....	xxx			x					
Cod-liver oil.....	xxx			xxx					
Yeast, pure dried: Bakers', brewers'.....		xxx			xxx				

¹ Vitamin B indicates the antineuritic factor of the vitamin B complex, while vitamin G indicates the factors stable to heat, including the pellagra-preventive factor.

² x indicates that the food material contains the essential; xx indicates that it is a good source; and xxx indicates that it is an excellent source.

³ Salt-water fish and shellfish contain some iodine.

The data in Table 6 are intended to give only a rough indication of the value of selected food materials in certain dietary essentials. They can not be used for making quantitative comparisons between the different food materials or between the different essentials in the same food material. Part of the data for vitamins A, B, and C are taken from United States Department of Agriculture. Circular 84, Vitamins in Food Materials. Other data are compiled from various sources.

TABLE 7.—*Nutritive values of 1 pound of the edible portion of selected food materials*

[Compiled from various sources]

Food material	Calories	Protein	Calcium	Phosphorus	Iron
Cereals:					
Bread—	<i>Number</i>	<i>Grams</i>	<i>Grams</i>	<i>Grams</i>	<i>Grams</i>
White, water.....	1, 139	34	0.058	0.269	0.0029
Whole-wheat, water.....	1, 129	44	.091	.694	.0073
Corn meal.....	1, 613	42	.082	.862	.0041
Flour—					
Graham.....	1, 627	60	.177	1.651	.0168
Whole wheat.....	1, 633	63	.141	1.080	.0113
White.....	1, 603	51	.051	.417	.0045
Hominy grits.....	1, 608	38	.070	.653	.0041
Rollod oats.....	1, 803	76	.313	1.778	.0172
Rice, polished.....	1, 591	36	.041	.435	.0041
Rice, unpolished.....	1, 592	36	.041	.939	.0091
Wheat germ.....	1, 803	132	.322	4.763	(1)
Rice polish.....	1, 796	57	.136	7.666	(1)
Milk:					
Whole.....	314	15	.544	.422	.0011
Skim.....	166	15	.553	.435	.0011
Cheese, eggs, lean meats, and fish:					
Cheese.....	1, 996	131	4.223	3.098	.0059
Eggs.....	672	61	.304	.816	.0136
Beef ²	965	68	.39	.733	.0102
Salmon, fresh.....	922	100	.109	1.148	.0054
Vegetables:					
Beans and peas—					
Green string beans, fresh.....	189	10	.209	.236	.0050
Dried navy beans.....	1, 564	102	.726	2.137	.0318
Dried peas.....	1, 612	112	.381	1.814	.0259
Green leaves—					
Cabbage.....	143	7	.204	.132	.0050
Chard, Swiss.....	172	15	.680	.181	.0113
Kale.....	231	15	.962	.272	.0141
Mustard greens.....	139	11	.998	.299	.0254
Spinach.....	108	10	.304	.308	.0163
Turnip tops.....	132	12	1.397	.249	.0299
Potatoes.....	378	10	.064	.263	.0059
Sweet potatoes.....	558	8	.086	.204	.0020
Root vegetables—					
Beets.....	209	7	.132	.177	.0027
Carrots.....	205	5	.254	.209	.0027
Onions.....	220	7	.154	.204	.0027
Turnips.....	179	6	.250	.209	.0023
Tomatoes.....	103	4	.050	.118	.0018
Fruits:					
Apples.....	290	1	.032	.054	.0014
Pears.....	315	5	.068	.118	.0014
Sugars:					
Molasses, cane.....	1, 301	11	.957	.200	.0331
Sugar, cane.....	1, 814				
Fatty foods:					
Butter.....	3, 488	5	.068	.077	.0009
Lard.....	4, 082				
Peanut butter.....	2, 487	117	.322	1.810	.0091
Salt pork, clear fat.....	3, 555	9			

¹ Indicates determinations not available.² Beef side, medium fat, as purchased.

